**Nelumbo** *Vol 57, (112-123) 2015*
*DOI : 10.20324/nelumbo/v57/2015/87115*

*ISSN (Print) : 0976-5069*
*ISSN (Online) : 2455-376X*

# Some noteworthy fresh–water Diatoms of Joypur Forest, Bankura District, West Bengal, India

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# जोयपुर वन, बांकुरिया जनपद, पश्चिम बंगाल, भारत से प्राप्त कुछ महत्वपूर्ण स्वच्छ जलीय डायटम्स

सुरजीत रॉय एवं जय प्रकाश केशरी

## सारांश

प्रस्तुत शोध पत्र में पश्चिम बंगाल के बांकुरिया जनपद स्थित जोयपुर वन के विभिन्न जलीय आवासों से संग्रहित किये गये स्वच्छ जलीय डायटम्स के 14 वंशों में समाहित 20 जातियों (टैक्सा) का विवरण दिया गया है।

## ABSTRACT

The present communication dealt with 20 taxa belongs to 14 genera of fresh water diatoms from different aquatic habitats of Joypur forest of Bankura district, West bengal.

**Keywords:** Diatoms, Habitats, New reports, West Bengal, India.

## INTRODUCTION

Members of Bacillariophyceae, commonly known as diatoms, are found in all kinds of habitats including freshwaters, sea waters, even in air, soil, or on rocks. The diatom cells are composed of siliceous walls, called frustules (Graham & al., 2009). They contribute to 25% of the atmospheric oxygen and approximately 43% of the primary production of the oceans (Tréguer & al., 1995). It is estimated that over 2 lakh taxa of diatoms exist worldwide (Mann & Droop, 1996) of which 25,000-30,000 taxa have documented till now.

Taxonomy and ecology of diatoms in India has been studied since the 18th century (Ehrenberg, 1845; Dickie, 1882; Carter, 1926; Skvortzow, 1935; Biswas, 1949a, 1949b; Gandhi, 1955, 1959a, 1959b, 1961, 1962a, 1962b, 1964, 1966, 1967, 1970, 1998 and Sarode & Kamat, 1979, 1980a, 1980b, 1983, 1984). Many workers from various corners of India have worked on diatom flora of particular mentioned may be made of Barhate & Tarar (1981, 1983, 1985), Bhoge & Raghothaman (2003), Desikachary & al. (1984, 1987), Gonzalves & Gandhi (1952, 1953, 1954), Iyengar & Venkataraman (1951), Jawale & Kumawat (2000), Karthick & al. (2009, 2010, 2013), Karthick &

Received: 9.7.15 Accepted: 9.11.15 Date of Publication: 31.12.15

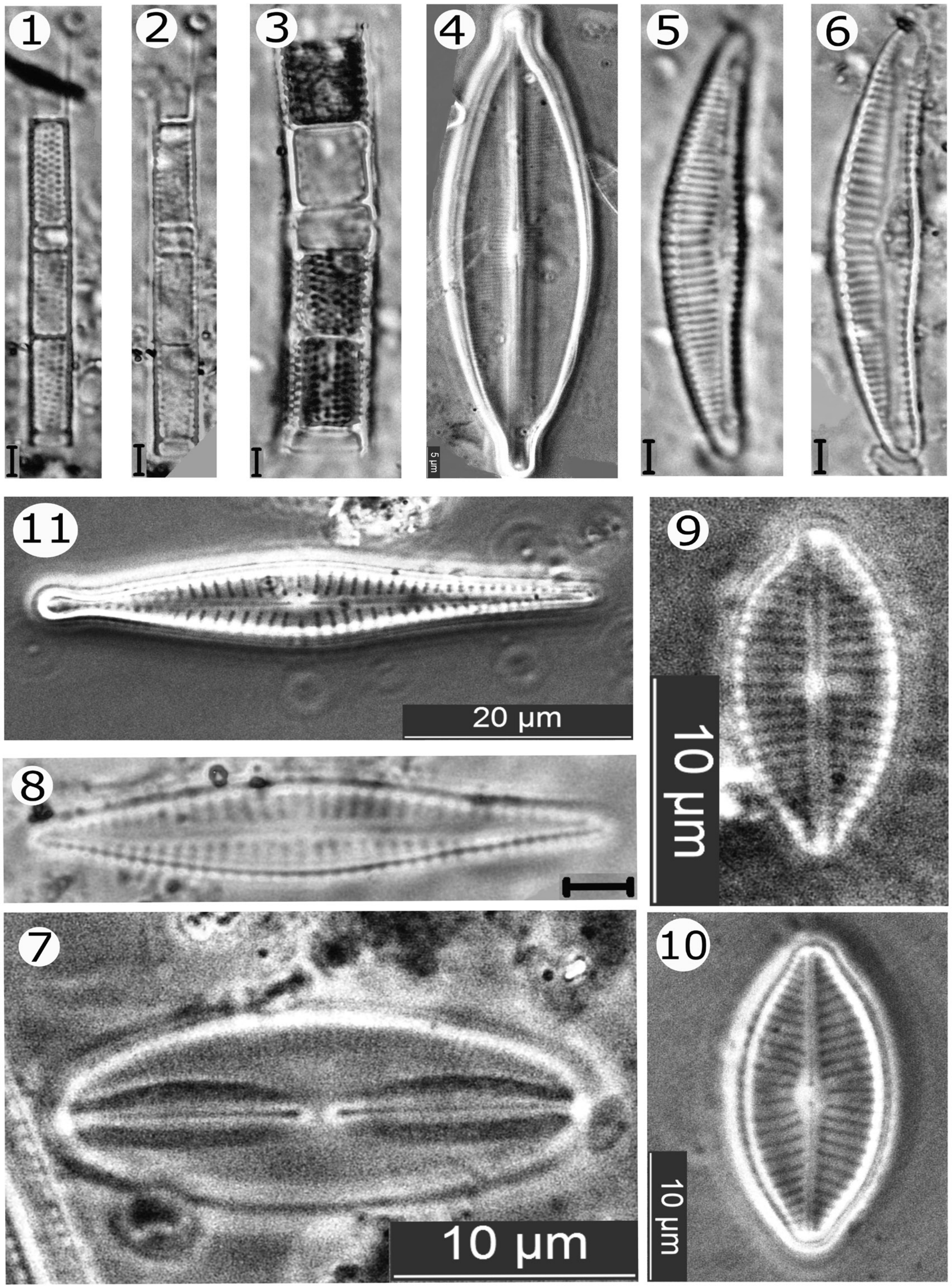

**Plate -I:** **1-2.** *Aulacoseira granulata* var. *angustissima* (O.F. Müll.) Simonsen; **3.** *Aulacoseira* cf. *ambigua* (Grunow) Simonsen; **4.** *Craticula ambigua* (Ehrenb.) Mann; **5-6.** *Encyonema lunatum* (W. Sm.) Van Heurck ; **7.** *Fallacia pygmaea* (Kütz.) Stickle & Mann; **8.** *Gomphonema gracile* Ehrenb. **9.** *Gomphonema parvulum* (Kütz.) Kütz.; **10.** *Placoneis gastrum* (Ehrenb.) Mereschk.; **11.** *Gomphonema* cf. *pantropicum* Reichard. (Scale: 1, 2, 3, 5, 6 & 8= 3 µm; 4= 5 µm; Figs. 7, 9 & 10= 10 µm; 11= 20 µm.)

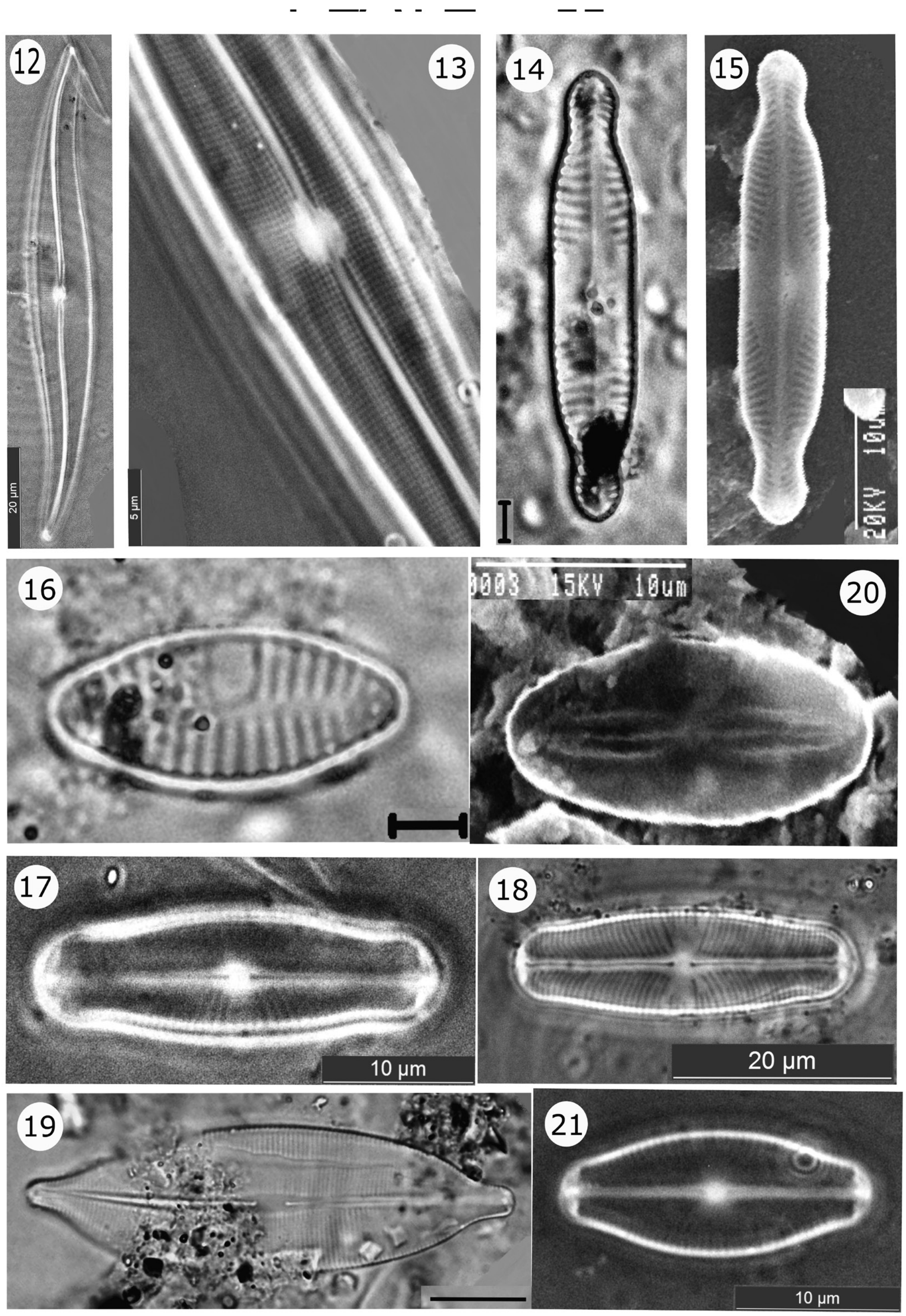

**Plate -II:** **12-13.** *Gyrosigma acuminatum* (Kütz.) Rabenh.; **14-15.** *Pinnularia amabilis* Krammer; **16.** *Planothidium frequentissimum* (Lange-Bertalot) Lange-Bertalot; **17-18.** *Sellaphora capitata* Mann & McDonald; **19.** *Craticula accomodiformis* Lange-Bertalot; **20.** *Fallacia pygmaea* (Kütz.) Stickle & Mann **21.** *Sellaphora pupula* (Kütz.) Mereschk.; (Figs. 15 & 20 are SEM image) (Scale: 12 & 18= 20 µm; Figs. 13, 15, 17, 20 & 21= 10 µm; Figs. 14 & 16= 3 µm; 19= 5 µm.)

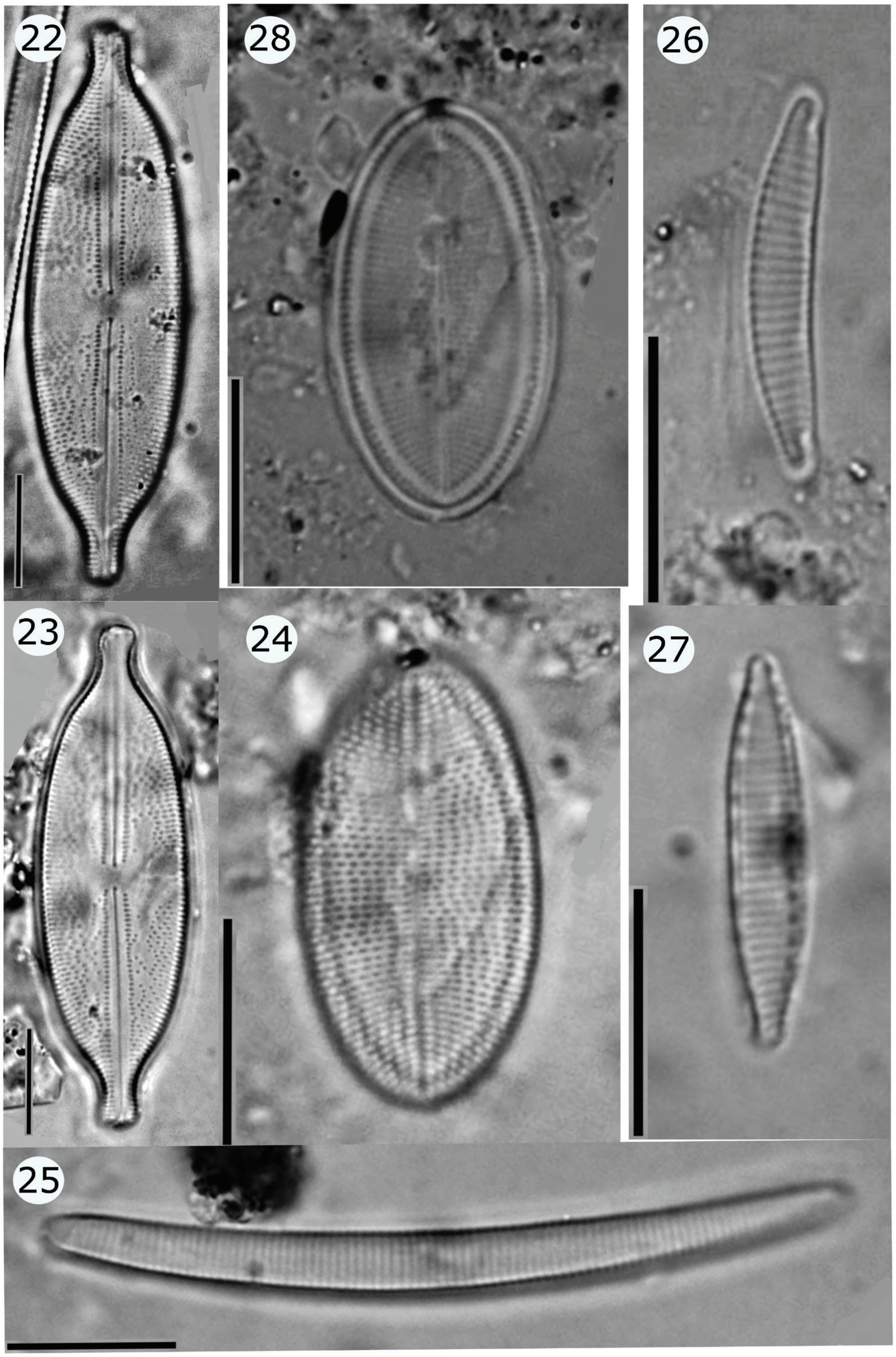

**Plate -III:** **22-23.** *Anomoeoneis sphaerophora* (Ehrenb.) Pfitzer; **24, 28.** *Cocconeis placentula* Ehrenb.; **25.** *Eunotia bilunaris* (Ehrenb.) Schaarschm.; **26.** *Eunotia* cf. *incisa* W. Sm. ex W. Greg.; **27.** *Nitzschia capitellata* Hust. (Scale 22-27= 5 µm.)

Kociolek (2012a--c), Misra & al. (2005, 2007), Narkhede & Raghothaman (2003, 2006, 2007), Nautiyal & al. (1995, 1996a-b, 2000), Pandey & Pandey (1980), Subrahmanyan (1946), Thomas & Gonzalves (1965a-g), Venkataraman (1939) and Venkataraman (1957). In Eastern India both taxonomic and ecological studies on diatoms are very scanty (Ehrenberg, 1845; Dickie, 1882; Carter, 1926 and Skvortzow, 1935) of which a few are from West Bengal such as by Ehrenberg, 1845; Skvortzow, 1935; Das & Santra, 1982; Prasad & al., 1988; Pal & Santra, 1990; Chowdhury & Pal, 2008 and Bhattacharya & al., 2011.

Recent years high resolution microscopy, SEM studies and modern techniques of cleaning of diatoms have made better understanding of their morphology. These studies lead to new insight in the taxonomy of diatom studies. Since the older works were based on the erstwhile available methodology and study technique, revision studies made on the basis of current knowledge and methodology helps in isolating the dubious taxa and consolidate our knowledge on taxonomy of Indian diatoms. In the present communication, twenty diatom taxa have been reported from an aquatic water body from Joypur forest of Bankura district of West Bengal. The correct names have been enumerated followed by synonym, family name in parenthesis, its dimension and concise distinct characters.

## MATERIAL AND METHODS

### Study area

Different water bodies of Joypur forest of Bankura district, West Bengal (Plate- IV, Figs. 1 & 2); were surveyed and diatom samples were collected on 13th February, 2009. The study site is located about 49 km. away from Bankura town and is situated at latitude 23°2’51”N and longitude 87°26’48”E.

### Sample collection

Epiphytic samples were collected from aquatic plants by crushing the submerged roots and stems. The resulting suspension was transferred into a plastic storage container. Epilithic samples were collected by vigorously scrubbing 3–5 stones from the substratum with a toothbrush and the resulting suspension transferred into plastic storage containers. All samples were preserved in 70% ethanol and pH, temperature and detail Notes were recorded simultaneously.

The collected preserved materials along with the slide preparations are stored in Department of Botany (Phycology laboratory), The University of Burdwan for future study and reference purpose.

### Cleaning technique and slide preparation

A portion of the sample was cleaned by removing the organic matter using either acids or hydrogen peroxide. These procedures are modified from the techniques of Welsh (1964), Hasle (1978), Lohman (1982), McBride (1988), Krammer & Lange-Bertalot (2000), Taylor & al. (2005) and Karthick & al. (2010). The samples were then repeatedly centrifuged at 3000-3500 rpm and alternatively rinsed with distilled water and mounted onto glass slides using Cedar wood oil as the mounting medium. Optimum conditions for light microscopy and scanning electron microscopy were tried to achieve as most structures of a frustule, used for identification, were fine and difficult to resolve.

### Microscopy

Light microscopy (LM) studies were carried out with a Leica DM 1000 LED compound light microscope equipped with phase contrast optics (100x oil immersion objectives in combination with a 10x eyepiece) and photographs were taken with a LAS software (version 4.1.0). Scanning electron microscopy was performed using cleaned specimens air dried on small squares of aluminium foil, and mounted on aluminium stubs using double-sided carbon tape. Stubs were sputter coated with gold and subsequently examined with a Hitachi S 530 SEM using accelerating Voltages 15 kV and a working distance of 7–12 mm.

## MORPHO-TAXONOMIC RESULTS

In this study, 20 diatom taxa under 14 genera have been recorded, out of these sub-division Coscinodiscophytina represented by 2 species and Bacillariophytina represented by 18 species. Classification followed as proposed by Round & al. (1990) and Medlin & Kaczmarska (2004). Identification of taxa was done with the help of relevant literature viz., Tiffany & Britton (1952), Hustedt (1959, 1961-1966), Foged (1978, 1981), Bateman & Rushforth (1984), Sarode & Kamat (1984), Gandhi (1998), Taylor & al. (2007) and Karthick & al. (2013). The detailed light

**Plate -IV:** **1.** Natural view of Joypur forest, Bankura.; **2.** Collection site near Joypur forest resort.

and scanning electron microscopic observations of taxa are given below along with habitat details.

## ENUMERATIONS

**Aulacoseira granulata var. angustissima** (O.F. Müll.) Simonsen 1979. *Melosira granulata* var. *angustissima* O.F. Müll. 1900. (Aulacoseiraceae ) **(Pl. I, Figs. 1 & 2)**

[Foged 1978, p. 82, pl. I, fig. 7; Sarode & Kamat 1984, p. 19, pl. 1, fig. 2; Taylor & al. 2007, pl. 2]

Valve diameter = 3-5 µm, Valve mantle depth = 5-24 µm, Striae density = 7-15/ 10 µm. Frustules adjoined end to end by elongated linking spines to form long filaments; valves mostly viewed in girdle view; ratio of mantle height to valve diameter > 3.2.

*Notes:* Collection No. – SR 32, pH- 6.5, temperature- 20°C, Habitat- planktonic; Collection No. – SR 45, pH- 7.0, temperature- 24°C, Habitat- epipelic.

Earlier reported from Digha Mohana, West Bengal (Chowdhury & Pal 2008) as *Melosira granulata* var. *angustissima* O.F. Müll.

**Aulacoseira cf. ambigua** (Grunow) Simonsen 1979. *Melosira ambigua* (Grunow) O.F. Müll. 1900. (Aulacoseiraceae ) **(Pl. I, Fig. 3)**

[Foged 1981, p. 104, pl. I, fig. 12; Taylor & al. 2007, pl. 2; Karthick & al. 2013, pl. 3]

Valve diameter = 11 µm, Valve mantle depth = 4-7 µm, Striae density = 10-15/ 10 µm. Distinguished by the fine striation and lack of elongated linking spines; rows of mantle areolae curved to right; separation valve with short, pointed spines; ratio of mantle height to valve diameter > 0.8.

*Notes:* Collection No. – SR 17, pH- 7.2, temperature- 21°C, Habitat- planktonic. The species is reported first time from West Bengal.

**Eunotia bilunaris** (Ehrenb.) Schaarschm. 1880. *Synedra bilunaris* Ehrenb. 1832; *Eunotia lunaris* (Ehrenb.) Grunow 1882. (Eunotiaceae) **(Pl. III, Fig. 25)**

[Hustedt 1959, p. 302, figs. 769 (a, b, d, e); Taylor & al. 2007, pl. 20; Karthick & al. 2013, pl. 33]

Valve length = 23.25 µm, Valve breadth = 1.75 µm, Striae density = 40/ 10 µm. Valves with short raphe and uniseriate striae; valves are lunate or curved with only a short portion of the raphe visible on the valve face; apices slightly swollen, rounded; striae indistinctly punctuate.

Notes: Collection No. – SR 38, pH- 5.5, temperature- 22°C, Habitat- epiphytic. First time reported from West Bengal.

**Eunotia cf. incisa** W. Sm. ex W. Greg. 1854. *Eunotia veneris* (Kütz.) De Toni 1892; *Eunotia veneris* (Kütz.) Berg 1939. (Eunotiaceae) **(Pl. III, Fig. 26)**

[Taylor & al. 2007, pl. 23; Karthick & al. 2013, pl. 32]

Valve length = 7.25 µm, Valve breadth = 1.25 µm, Striae density = 15-17/ 10 µm. Valves with short raphe and uniseriate striae; the dorsiventral valve has a straight ventral margin; narrow pointed slightly asymmetrical apices; apices acutely rounded; helictoglossae set in equidistant from the ends.

*Notes:* Collection No. – SR 72, pH- 5.7, temperature- 20°C, Habitat- epiphytic;Collection No. – SR 28, pH- 6.0, temperature- 24°C, Habitat- epipelic. First time reported from West Bengal.

**Anomoeoneis sphaerophora** (Ehrenb.) Pfitzer 1871. *Navicula sphaerophora* Kütz. 1844; *Navicula amphisbaena* var. *sphaerophora* (K***ütz***.) Rabenh. 1847. (Anomoeoneidaceae) **(Pl. III, Figs. 22 & 23)**

[Hustedt 1959, p. 740, fig. 1108a; Sarode & Kamat 1984, p. 98, pl. 11, fig. 238; Gandhi 1998, p. 147, pl. I, figs. 37-40; Karthick & al. 2013, pl. 58]

Valve length = 25 µm, Valve breadth = 10-11 µm, Striae density = 18-24/ 10 µm. Valves linear elliptical in outline; apices rostrate; axial area linear bordered with a single row of punctae; striae mostly radiate and parallel near apices; characterised by large lateral hyaline area.

*Notes:* Collection No. – SR 13, pH- 6.5, temperature- 20°C, Habitat- epipelic. First time reported from West Bengal.

**Placoneis gastrum** (Ehrenb.) Mereschk. 1903. *Pinnularia gastrum* Ehrenb. 1843, *Navicula gastrum* (Ehrenb.) Kütz. 1844; *Schizonema gastrum* (Ehrenb.) Kuntze 1898. (Cymbellaceae) **(Pl. I, Fig. 10)**

[Tiffany & Britton 1952, p. 256, pl. 67, fig. 786]

Valve length = 23.42 µm, Valve breadth = 10.28 µm, Striae density = 12/ 10 µm. Valve linear to lanceolate; ends sometimes rostrate to capitates; striae uniseriate and transverse striations radial, medianly alternately long and short; central area widened.

*Notes:* Collection No. – SR 23, pH- 7.5, temperature- 24°C, Habitat- epiphytic. First time reported from West Bengal.

**Encyonema lunatum** (W. Sm.) Van Heurck 1896. *Cymbella lunata* W. Sm. 1855. (Cymbellaceae) **(Pl. I, Figs. 5 & 6)**

[Bateman & Rushforth 1984, p. 15, pl. 4, figs. 77-78]

Valve length = 42 µm, Valve breadth = 7.5 µm, Striae density = 9/ 10 µm. Taxa with a raphe on both valves; strongly dorsiventral cells with ventrally deflected polar raphe endings; valves dorsiventral, semi-lanceolate; central area absent or indistinct; striae more in number in ends than centre.

*Notes:* Collection No. – SR 23, pH- 7.5, temperature- 24°C, Habitat- epiphytic. Collection No. – SR 32, pH- 7.5, temperature- 20°C, Habitat- planktonic. First time reported from West Bengal.

**Gomphonema parvulum** (Kütz.) Kütz. 1849. *Sphenella parvula* Kütz. 1844, *Sphenoneis parvula* (Kütz.) Trevis. 1848, *Gomphonella parvula* (Kütz.) Rabenh. 1853. (Gomphonemataceae) **(Pl. I, Fig. 9)**

[Gandhi 1998, p. 30, pl. II, figs. 53-56; Karthick & al. 2013, pl. 79]

Valve length = 14.375 µm, Valve breadth = 6.67 µm, Striae density =17/ 10 µm. Valves weakly heteropolar club-shaped, lanceolate to elliptical to oval; apices protracted, weakly capitates; axial area narrow, linear; striae parallel to weakly radial, indistinctly punctuate.

*Notes:* Collection No. – SR 07, pH- 7.5, temperature- 20°C, Habitat- epilithic.

Earlier reported from Kolkata, West Bengal (Skvortzow 1935) as *Gomphonema parvulum* (Kütz.) Grun.

**Gomphonema gracile** Ehrenb. 1838 (Gomphonemataceae) **(Pl. I, Fig. 8)**

[Foged 1978, p. 69, pl. XL, figs. 21-22; Taylor & al. 2007, pl. 125; Karthick & al. 2013, pl. 77]

Valve length = 31 µm, Valve breadth = 5.78 µm, Striae density = 13/ 10 µm. Valves weakly heteropolar, clavate, lanceolate to rhombic lanceolate; axial area linear narrowing slightly towards the apices; central area rounded, commonly asymmetrical, formed by the shortening of the central striae; striae weakly radial throughout, indistinctly punctate.

*Notes:* Collection No. – SR 25, pH- 6.5, temperature- 21°C, Habitat- epilithic.

Earlier reported from Kolkata, West Bengal (Ehrenb., 1854) and Kalimpong, West Bengal (Prasad & al., 1988).

**Gomphonema cf. pantropicum** Reichard. 2015 *Gomphonema subtile* var. *malayense* Hust. 1942. (Gomphonemataceae) **(Pl. I, Fig. 11)**

[Reichard. 2015, p. 33, figs. 87-107]

Valve length = 50.52 µm, Valve breadth = 9.47 µm, Striae density = 8/ 10 µm. Valves slender and narrow; lanceolate in shape, convexly widened at the middle part and drawn out at the ends; head pole is capitate in shape, strongly constricted below the head; narrow and sharply protracted apices; the axial area is somewhat broader; the striae are more coarsely punctate and valves are consistently broader.

*Notes:* Collection No. – SR 38, pH- 5.5, temperature- 22°C, Habitat- epiphytic. First time reported from West Bengal.

**Cocconeis placentula** Ehrenberg 1838. *Cocconeis pediculus* var. *placentula* (Ehrenb.) Grunow 1867, *Cocconeis communis* var. *placentula* (Ehrenb.) O. Kirchn. 1878; *Cocconeis communis* f. *placentula* (Ehrenb.) Chmiel. 1885. (Cocconeidaceae) **(Pl. III, Figs. 24 & 28)**

[Foged 1978, p. 42, pl. XII, figs. 7-8; Taylor & al. 2007, pl. 30]

Valve length = 9.5-15 µm, Valve breadth = 6-10 µm, Striae density = 24-26/ 10 µm (RV), 20-23/ 10 µm (RLV). Taxa usually have a curved or flexed valve face; presence of hyaline ring on raphid valve; valves range from broadly elliptical to lanceolate-elliptical; striae composed of funnel-shaped puncta.

Notes: Collection No. – SR 66, pH- 6.5, temperature-20°C, Habitat- epilithic.

Earlier reported from Kolkata, West Bengal (Ehrenberg 1854).

**Planothidium frequentissimum** (Lange-Bertalot) Lange-Bertalot 1999. *Achnanthes lanceolata* subsp. *frequentissima* var. *frequentissima* Krammer & Lange-Bertalot 1991*; Achnanthes lanceolata* subsp. *frequentissima* Lange-Bertalot 1993; *Achnantheiopsis frequentissima* (Lange-Bertalot) Lange-Bertalot 1997. (Achnanthidiaceae) **(Pl. II, Fig. 16)**

[Taylor & al. 2007, pl. 29]

Valve length = 15.75 µm, Valve breadth = 6.75 µm, Striae density = 11/ 10 µm. Taxa with a raphe on only one valve; taxa usually have a curved or flexed valve face; araphid valve with horseshoe-shaped septum; valves are elliptical to elliptical-lanceolate with clearly visible striation.

*Notes:* Collection No. – SR 32, pH- 6.5, temperature-20°C, Habitat- planktonic. First time reported from West Bengal.

**Sellaphora capitata** Mann & McDonald 2004. *Navicula pupula* var. *capitata* Skvortzow & Mey. 1928; *Navicula pupula* f. *capitata* (Skvortzow & Mey.) Hust. 1961; *Sellaphora pupula* var. *capitata* (Skvortzow & Meyer) Poulin. (Sellaphoraceae) **(Pl. II, Figs. 17 & 18)**

[Hustedt 1961-66, p. 122, figs. 1254 (i-m); Foged 1978, p. 96, pl. XXVIII, fig. 7; Karthick & al. 2013, pl. 50]

Valve length = 32.75 µm, Valve breadth = 9.75-10.75 µm, Striae density = 18/ 10 µm. Silica thickenings near valve apices; valve linear-elliptical, with broad, subcapitate poles; raphe slightly sinous; parallel polar bars present; striae uniseriate.

*Notes:* Collection No. – SR 56, pH- 6.8, temperature-22°C, Habitat- epipelic. First time reported from West Bengal.

**Sellaphora pupula** (Kütz.) Mereschk. 1902. *Navicula pupula* Kützing 1844; *Schizonema pupula* (Kützing) Kuntze 1898. (Sellaphoraceae) **(Pl. II, Fig. 21)**

[Hustedt 1961-66, p. 120, figs. 1254 (a-g); Foged 1978, p. 96, pl. XXVIII, fig. 9; Karthick & al. 2013, pl. 51]

Valve length = 15-22.5 µm, Valve breadth = 7 µm, Striae density = 18-24/ 10 µm. Silica thickenings near valve apices; valve bipolar, bilaterally symmetrical, very variable in shape; rounded or rostrate poles; raphe central; central area variable, often bordered by alternating long and short striae; striae radial at the centre; parallel to radiate polar bars.

*Notes:* Collection No. – SR 28, pH- 6.0, temperature-24°C, Habitat- epipelic.

First time reported from West Bengal.

**Fallacia pygmaea** (Kütz.) Stickle & Mann 1990. *Navicula pygmaea* Kütz. 1849, *Schizonema pygmaeum* (Kütz.) Kuntze 1898; *Lyrella pygmaea* (Kütz.) Makarova & Karajeva 1987. (Sellaphoraceae) **(Pl. I, Fig. 7; Pl. II, Fig. 20)**

[Hustedt 1961-66, p. 538, figs. 1574; Sarode & Kamat 1984, p. 119, pl. 13, fig. 301; Gandhi 1998, p. 180, pl. V, figs. 169-173; Taylor & al. 2007, pl. 56]

Valve length = 21 µm, Valve breadth = 9.45 µm, Striae density = 24-26/ 10 µm. Elliptical with broadly rounded ends; raphe thin and straight with central pores closely set and distinct; axial area very narrow; striae radial, interrupted in the axial region by H shaped hyaline area.

*Notes:* Collection No. – SR 13, pH- 6.5, temperature-20°C, Habitat- epipelic.

Earlier reported from Kolkata, West Bengal (Skvortzow 1935) as *Navicula pygmaea* var. *indica* Skvortzow but according to Guiry & Guiry (2015) *Navicula pygmaea* var. *indica* Skvortzow is a preliminary Algae base entry that has not been subjected to any kind of verification and thus not a valid taxa. The dimensions and characteristics of *Navicula pygmaea* var. *indica* Skvortzow clearly indicate that it is none other than the present *Fallacia pygmaea* (Kütz.) Stickle & Mann. So instead of the variety we have considered it as *Navicula pygmaea* Kütz..

**Pinnularia amabilis** Krammer 2000. (Pinnulariaceae) **(Pl. II, Figs. 14 & 15)**

[Karthick & al. 2013, pl. 73]

Valve length = 36.75 µm, Valve breadth = 7.125 µm, Striae density = 8-11/ 10 µm. Valves linear, with slightly undulate valve outline; ends broadly capitate without distinct shoulders; chambered striae; raphe narrow and undulate; proximal raphe ends unilaterally bent; striae curved and radiate.

*Notes:* Collection No. – SR 70, pH- 6.8, temperature-22°C, Habitat- epilithic;

Collection No. – SR 72, pH- 5.7, temperature- 20°C, Habitat- epiphytic; Collection No. – SR 32, pH- 6.5, temperature- 20°C, Habitat- planktonic.

First time reported from West Bengal.

**Gyrosigma acuminatum** (Kütz.) Rabenh. 1853. *Frustulia acuminata* Kütz. 1833; *Sigmatella acuminata* (Kütz.) Br**è**b. *& Godey 1835, Navicula acuminata* (Kütz.) Kützing 1844; *Pleurosigma acuminatum* (Kütz.) W. Sm. 1852 and *Pleurosigma acuminatum* (Kütz.) Grunow 1860. (Pleurosigmataceae) **(Pl. II, Figs. 12 & 13)**

[Tiffany & Britton 1952, p. 268, pl. 66, fig. 759; Sarode & Kamat 1984, p. 66, pl. 7, fig. 145; Karthick & al. 2013, pl. 35]

Valve length = 96.8 µm, Valve breadth = 11.2 µm, Striae density =18/ 10 µm. Frustules solitary, sigmoid, lanceolate in outline; gradually tapering from the middle towards the ends; ends broadly rounded; raphe sigmoid and central; transverse and longitudinal striae at equal distances from one another.

*Notes:* Collection No. – SR 19, pH- 6.9, temperature- 22°C, Habitat- epilithic;

Collection No. – SR 72, pH- 5.7, temperature- 20°C, Habitat- epiphytic.

First time reported from West Bengal.

**Craticula ambigua (Ehrenb.) Mann 1990.** *Navicula ambigua* Ehrenb. 1843; *Vanheurckia ambigua* (Ehrenb.) Bréb. 1869; *Navicula cuspidata* var. *ambigua* (Ehrenb.) Kirchner 1878, *Navicula cuspidata* var. *ambigua* (Ehrenb.) Cleve 1894 and *Vanheurckia cuspidata* var. *ambigua* (Ehrenb.) Playfair 1914. (Stauroneidaceae) **(Pl. I, Fig. 4)**

[Taylor & al. 2007, pl. 47; Karthick & al. 2013, pl. 46]

Valve length = 73.5 µm, Valve breadth = 20.5 µm, Striae density = 16/ 10 µm. Valves elliptic-lanceolate with capitate valve ends and protracted rostrate apices; raphe filiform, striae parallel; raphe filiform, proximal raphe ends deflected slightly to one side; axial area narrow and linear; striae very weakly radiate and convergent at ends.

Notes: Collection No. – SR 32, pH- 6.5, temperature- 20°C, Habitat- planktonic; Collection No. – SR 23, pH- 7.5, temperature- 24°C, Habitat- epiphytic. Earlier reported from Kolkata, West Bengal (Skvortzow 1935) as *Navicula cuspidata* var. *ambigua* (Ehrenb.) Cleve.

**Craticula accomodiformis** Lange-Bertalot 1993. (Sellaphoraceae) **(Pl. II, Fig. 19)**

[Taylor & al. 2007, pl. 47; Karthick & al. 2013, pl. 48]

Valve length = 24.5 µm, Valve breadth = 7.5 µm, Striae density = 25-35/ 10 µm. Valves broadly elliptic-lanceolate with short rostrate apices; raphe filiform and straight, central area small and distinct; axial area narrow, linear and distinct; striae parallel and punctate.

*Notes:* Collection No. – SR 17, pH- 7.2, temperature- 21°C, Habitat- planktonic. First time reported from West Bengal.

**Nitzschia capitellata** Hust. 1922 (Bacillariaceae) **(Pl. III, Fig. 27)**

[Taylor & al. 2007, pl. 159]

Valve length = 7.75 µm, Valve breadth = 1.625 µm, Striae density =18-20/ 10 µm.Valves linear to linear-lanceolate. Raphe on both valves and on opposite sides of the frustules; margins are more or less concave in the middle; the poles are cuneate and the apices mostly capitate.

*Notes:* Collection No. – SR 32, pH- 6.5, temperature- 20°C, Habitat- planktonic. First time reported from West Bengal.

## DISCUSSIONS

The vegetation of the study area is mainly dominated with *Shorea robusta* C.F.Gaertn., *Butea monosperma* (Lam.) Taub., *Madhuca longifolia* J.F.Macbr., *Azadirachta indica* A.Juss. and *Tectona grandis* L.f.. The thick vegetation of the area makes a suitable environment for the growth of diatoms in association with pebbles and small cobbles in the water bodies. In absence of cobbles or pebbles, emergent or submerged macrophytes – such as *Paspalum vaginatum* Sw., *Cyperus alopecuroides* Rottb., *Jussiaea repens* L., *Nymphoides hydrophylla* (Lour.) Kuntze, *Hydrilla verticillata* (L.f.) Royle, *Nymphaea rubra* Roxb. ex Salisb., *Nelumbo nucifera* Gaertn., *Utricularia aurea* Lour., *Vallisneria spiralis* L. etc. act as favoured substratum for the growth of diatoms. Habitat preferences are crucial for determining biological diversity and primary productivity (Reavie & Smol, 1997)

During this study it was observed that, *Aulacoseira* species were mainly planktonic, *Eunotia* species were found mostly in epiphytic habitats preferring moderately acidic waters; while species of *Fallacia*, *Sellaphora*, *Anomoeoneis* mostly prefer epipelic habitats. *Encyonema lunatum* was found in both epiphytic and planktonic form. Whereas *Gomphonema* species mostly prefer epilithic and epiphytic conditions. *Cocconeis placentula* was found in abundance on the surface of stones of

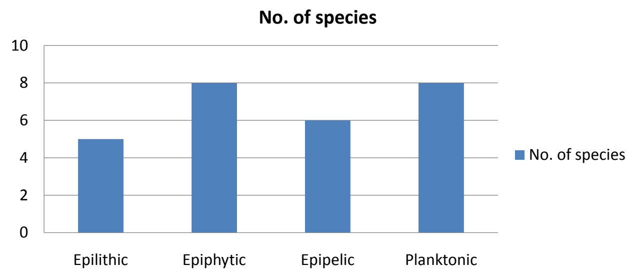

**Chart -1:** Habitat diversity of diatom taxa found from Joypur forest, Bankura, West Bengal, India.

canals. *Nitzschia capitellata* was tolerant to extremely polluted conditions and found planktonic form. Species of *Pinnularia*, *Placoneis*, *Gyrosigma* and *Craticula* were not found in having any specific habitat preferences. Epiphytic and planktonic forms are most dominant forms and diatoms mostly prefer these two habitats in Joypur forest (Chart. 1).

In this account 14 taxa are recorded for the first time from West Bengal viz. *Aulacoseira* cf. *ambigua* (Grunow) Simonsen, *Eunotia bilunaris* (Ehrenb.) Schaarschm., *Eunotia* cf. *incisa* W. Sm. Ex Gregory, *Anomoeoneis sphaerophora* (Ehrenb.) Pfitzer, *Placoneis gastrum* (Ehrenb.) Mereschk., *Encyonema lunatum* (W. Sm.) Van Heurck, *Gomphonema* cf. *pantropicum* Reichard., *Planothidium frequentissimum* (Lange-Bertalot) Lange-Bertalot, *Sellaphora capitata* Mann & McDonald, *Sellaphora pupula* (Kütz.) Mereschk., *Pinnularia amabilis* Krammer, *Gyrosigma acuminatum* (Kütz.) Rabenh., *Craticula accomodiformis* Lange-Bertalot and *Nitzschia capitellata* Hust..

## ACKNOWLEDGMENTS

Thanks are due to the Head of the Department of Botany, The University of Burdwan for providing laboratory facilities, to U.G.C., New Delhi for financial assistance and to research scholars of Phycology section for their help in various occasions.

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